DOCUMENT RESUME

ED 136 937 PS 009 182

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TITLE The University of Illinois Study of the Differential Effects of Five Preschool Programs.
PUB DATE Apr 77
NOTE 15p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, New York, April 4-8, 1977); Adapted from a chapter in J. C. Stanley (Ed.), "Compensatory Education for Children Ages Two to Eight: Recent Studies of Educational Intervention," Baltimore: The Johns Hopkins University Press, 1973, pp. 109-144

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Achievement Gains; Achievement Tests; *Comparative Analysis; *Early Childhood Education; Educational Alternatives; Intelligence Quotient; *Intervention; Longitudinal Studies; *Preschool Programs; *Program Evaluation; Verbal Ability

ABSTRACT

This paper summarizes the findings from a two-part evaluation study which compared the effects of five model preschool intervention programs and examined 5-year longitudinal data on the effects of three of these five programs. The original five programs (Traditional, Community-Integrated, Montessori, Karnes and Bereiter-Engelmann) represented a continuum from traditional nursery to highly structured preschool. Brief descriptions of each of these preschool models are included. Seventy-five children who met age, income and family history criteria and had no previous school experience were divided into groups matched on IQ, sex, and race. These groups were then randomly assigned to a particular intervention model. Differences in effectiveness among the models were assessed by means of batteries of standardized tests which were administered prior to the intervention, following the preschool year, and at the end of the kindergarten year. Results from analyses of this data are presented and discussed. Follow-up data over three additional years were gathered on the Traditional, the Karnes, and the Bereiter-Engelmann models. The results and conclusions from these data are also presented. (JMB)

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The University of Illinois Study of the Differential Effects of Five Preschool Programs*

Merle B. Karnes

In 1965 we undertook a study to determine the differential effects of five preschool interventions. Assessment of differences was evaluated through batteries of standardized tests administered prior to the intervention, following the preschool year, and at the end of the kindergarten year. In addition, the effects of three of these programs were evaluated over a five-year period.

The classroom programs in the five model preschool intervention studies were chosen on theoretical as well as practical bases. One major consideration was degree of structure along a continuum from the traditional nursery to the highly structured preschool. The nature of teacher-child interaction was considered to be the critical dimension of structure: as the specificity and intensity of this interaction increased, so did the degree of structure. Two programs (Traditional [K_2] and Community-Integrated) represented the less structured end of the continuum, a third (Montessori) embodied an established theory which included much that can be identified with a child-centered or traditional approach and a methodology which incorporated considerable structure; the fourth (Karnes [K_1]) and the fifth (Bereiter-Engelmann B-E) programs fell at the highly structured end of the continuum.

Comparability was initially sought by identifying 75 children who met age (CA 4-0), income, family history, and no previous preschool experience criteria. In addition, children were administered the Stanford-Binet Individual Intelligence Test, Form L-M, and stratified into three groups on the basis of these IQ results (100+, 90-99, 70-89). Children were then assigned to classes such that there was comparability of IQ, sex (50 percent-50 percent), and race (67 percent Black and 33 percent White). Finally, each class unit was randomly assigned to a particular intervention group-B-E (1 class), K_1 (2 classes), K_2 (2 classes).

During the second year of the project the previous procedures for placement of children were followed, resulting in comparable groups assigned as follows: B-E (1 class), Montessori (1 class), and Community-Integrated (a total of sixteen children assigned to middle-class community preschools). A multivariate analysis of covariance was then used as the basic statistical technique for analyzing the data.

After two years, then, there were two classes each (N=15 per class) of the B-E, K_1, and the K_2 programs and one class each of the Montessori and Community-Integrated. The Community-Integrated, Montessori, and Bereiter-Engelmann programs were directed by their own staffs. I directed the K_1 and K_2 programs. In each program, children attended daily sessions of approximately two hours and fifteen minutes, five days per week, for a period of no less than seven nor more than eight months.

PS009182

*Adapted from M. B. Karnes, Evaluation and implications of research with young handicapped and low-income children. In J. C. Stanley (ed.), Compensatory Education for Children Ages Two to Eight: Recent Studies of Educational Intervention. Baltimore: The Johns Hopkins University Press, 1973, pp. 109-144.

RESULTS AND CONCLUSIONS AT THE END OF THE PRESCHOOL YEAR

The two highly structure programs (K_1 and B-E) demonstrated a substantial mean gain (14 points) in intellectual functioning (Binet IQ, see Fig. 1) at the end of the first year (7- to 8-month interval). No child in either of these two programs failed to make an IQ gain; 92 percent of the children in the K_1 program and 74 percent of the children in the B-E group fell into the above-average intelligence strata. The other three experimental groupings made more modest mean gains (5 to 8 points), and from 14 to 24 percent of these children regressed. Clearly, the test-two performance of the K_1 and B-E groups on the Stanford-Binet was superior to the performance of the other three groups.

On the intial assessment of language development (ITPA), the children in this study were most deficient on the three subtests related to verbal expressive abilities: Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association. During the treatment period, children in the K_1 group eliminated their initial major deficiencies on each of these three subtests (Fig. 2), while the B-E group eliminated a major deficiency on two of these three subtests. The K_2 group made improvements in all three areas, but not to the extent of the B-E and K_1 groups. The performances of the Community-Integrated and Montessori groups on these three subtests were, at most, static.

The failure of the Montessori children to demonstrate appreciable progress seems to invalidate the notion that the level of structure relates to the progress made by the disadvantaged child. The Montessori program provided a high degree of structure in terms of careful planning for the kinds of sensory-motor activity thought appropriate to the development of an adequate base from which language and cognitive skills arise, and these provisions may be considered comparable to the activities used to elicit verbal responses (the game format) in the K_1 program or to the pattern drill employed in the B-E program. The Montessori teacher provided a "prepared environment," but did not systematically engage the child in verbalizations or require such verbalizations as part of the definition of productive involvement. This failure of the Montessori program resulted, at least during the intervention interval, in somewhat regressive language behavior. Structured emphasis on sensory-motor development without similar concern for verbal development programmatically moves in the wrong direction for the disadvantaged child.

The expectation that children in the Community-Integrated group would show progress equal to or greater than that of the children in the K_2 group was not substantiated. The disadvantaged children in the Community-Integrated program failed to incorporate the language model of their advantaged peers, because they did not reciprocate in verbal interactions at any significant level. The program of the K_2 group, on the other hand ensured that the children responded verbally during certain activities. Their teachers necessarily accommodated these activities to the verbal level of the children and gradually developed more acceptable and extended responses. The progress in verbal expressive ability made by the children in the K_2 program reflects this accommodation.

The very real progress made by the children in the K_2 progress must be viewed against the generally superior performance of the children in the two highly structured programs (B-E and K_1). The magnitude and consistency of the gains of the K_1 and B-E groups in intellectual functioning (Binet IQ) clearly endorse the importance of providing a setting in which the child is required to make appropriate and increasingly complex verbalizations. There is some evidence that obtaining these verbalizations in conjunction with productive, manipulative experiences (K_1 program) more effectively developed visual perceptual skills (Frostig), as well as the visual-motor skills involved in certain ITPA subtests (Visual Decoding, Visual-Motor Sequencing, and Motor Encoding). In addition, children who made verbal responses concurrent with meaningful, manipulative experiences more effectively incorporated syntactical constructs into their verbal repertoire (Auditory-Vocal Automatic subtest). On the other hand, verbal pattern drills (B-E program provided unique opportunities to develop the auditory reception of structured aspects of language (Auditory-Vocal Association and Auditory Decoding subtests).

RESULTS AND CONCLUSIONS AT THE END OF SECOND YEAR (KINDERGARTEN)

During their second year in the study, the children in the K_2, Community-Integrated, and Montessori programs attended a public kindergarten for a half day where no research intervention was made. In contrast, the children in the K_1 program attended public kindergarten in the morning and, in addition, participated in a one-hour supportive program at the research center in the afternoon. According to the research design, children in the B-E program were not to attend public kindergarten and were to return to the research center for a half-day program.

At the end of the second year of intervention, the performance of the B-E group in intellectual functioning (Binet IQ) was superior to that of the other four groups (see Fig. 1). Only the children in the B-E group made a substantial gain during the second year (6 points). The four groups that attended public kindergarten the second year basically maintained the gains in intellectual functioning made during the first year; typically, losses or gains did not exceed 3 points. Although the supportive program for the Karnes group (K_1) was unsuccessful in fostering further IQ gains, it did result in gains in other areas.

Of the three groups who attended only public kindergarten the second year, the Community-Integrated and Montessori groups demonstrated the least change on verbal expressive abilities (Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association). To simplify the reporting of these findings, the combined means of these scores are presented graphically in Figure 3. The K_2 group, although it had shown relatively good progress on these three subtests during the preschool year, tended to regress during the kindergarten year. The Montessori group, on the other hand, which had demonstrated a regressive pattern the first year, made substantial gains during the kindergarten year. The regressive performance during the second year of the K_1 group is particularly distressing, since these children also attended a one-hour supportive program in reading and arithmetic readiness. Note, however, that language was not

given primary emphasis the second year. The B-E group was the only group that showed continued and appreciable progress in language development over the two-year period and was at or above its chronological age on the three subtests related to verbal expressive abilities. As reported earlier, the B-E children were provided with two-and-a-half hours daily of an intensive program with major emphasis on language development. *These results, together with the results on intellectual functioning, provide information to endorse the need for continued special programming, especially in language.*

On the assessment of *school readiness* (Metropolitan), the reading readiness performance of the K_1 group was significantly higher than those of the other four groups. This result is rather surprising in view of the B-E group's higher scores in intellectual functioning (Binet) and language development (ITPA). The failure of the B-E group to achieve school readiness scores superior to those of the other groups, especially the three groups who attend public kindergarten only, is puzzling, since its curriculum included an intensive two-year reading program beginning at age four. A major intent of the K_1 supportive program had been to prepare children for formal reading instruction, and this focus appropriately developed reading readiness skills as measured by the Metropolitan test. Thirty-eight percent of the children in the K_1 program achieved a superior reading readiness status, and 67 percent of the children in this group were rated high normal and above. No child in the other four programs earned a superior rating, and from 15 to 31 percent of the children in these groups were in the high normal range. Nearly equal percentages of the children in these four groups fell in the high, average, and low ranges. The favorable reading prediction for the large number of children in the K_1 program is complemented by the few children who received low normal ratings, less than one-fourth the percentage of any other group.

The one-hour supportive K_1 program was successful in fostering further development of school readiness (Metropolitan). Only the B-E group made consistent and continued progress in all areas over the two-year period. They were also the only one of the five groups that had two and one-half hours per day of special programming.

It seems clear that one year of preschool programming, no matter how immediately effective, did not equip disadvantaged children to maintain performance in the kindergarten setting. Regardless of the progress made in preschol by the four groups of children which attended public kindergarten, their relative performances deteriorated during the second year, which supports the current belief that typical public school kindergarten programming for disadvantaged children is inappropriate. Since one of the principal findings of the first year was that intensive teacher-child interaction is critical to maximum language development, and since this kind of action is critical to maximum language development, and since this kind of interaction cannot occur with the teaching ratio of the public kindergarten, the deterioration in language development is not surprising. Only children in the B-E program, which maintained a low pupil-teacher ratio and intensive pupil-teacher interaction the second year, made continuing progress in language development.

During the first year of the study, the K_1 programming was appropraite and highly effective, and the children made remarkable progress in all areas, particularly those of initial inadequacy. This encouraging educational prognosis contributed to a shift in emphasis from language development to school readiness in the one-hour supportive program. The marked regression in verbal expressive abilities experienced by these children during the kindergarten year suggests that this shift in emphasis was ill advised or at least premature. The additional one-hour supportive program did indeed promote superior academic readiness, but failed to maintain the level of language functioning achieved in the K_1 preschool.

Only the children who attended the B-E preschool were provided low pupil-teacher ratios and intensive language programming over the two-year period, and only these children showed continued growth in all aspects of the test battery. The second-year IQ gain of this group is particularly encouraging, as are the remarkable two-year gains in verbal expressive abilities. Only in the area of reading readiness did these children fail to achieve superior performance. This study offers no direct evidence to support the early introduction of reading instruction to disadvantaged children.

RESULTS AND CONCLUSIONS OF A FOLLOW-UP OF THREE OF THE FIVE PRESCHOOL INTERVENTIONS OVER A THREE-YEAR PERIOD

Follow-up data over three years were gathered on the K_2 group (N=25), the K_1 group (N=24), and the first class of the B-E group (N=10).

School achievement at the end of the first grade was considered to be a critical criterion in assessing program effectiveness. The *reading achievement* of the K_1 and B-E groups, as measured by the California Achievement Tests, was significantly higher than that of the K_2 group. Two years of reading instruction in the B-E program prior to first grade seems to have been only as effective as the extensive readiness preparation in the K_1 program in producing accelerated reading development. This follow-up study provides little evidence to support the introduction of early reading programs for disadvantaged children.

The K_1 and B-E groups were significantly higher than the K_2 group on the California *arithmetic* test at the end of the first grade, confirming the prediction that the structured groups would better prepare the children for the more formal work of first-grade mathematics.

At the end of the third year of the study, when all children were completing the first grade, there were no significant differences on Binet performances among the three groups. There were no statistical differences among the ITPA total performance of the three groups at the end of the third year of the study. All groups regressed during the first-grade year.

No intervention program was entirely successful in providing the impetus necessary to sustain at the end of first grade the gains in intellectual functioning and language development made during the preschool years. In

spite of the disappointments of some of the longitudinal data, however, a major accomplishment of this study remains: Serious learning deficits of the disadvantaged children in the K_1 and B-E groups were eliminated during the preschool year. In the B-E program, where an extensive intervention was sustained over a two-year period, continued growth occurred. The deterioration in language and intellectual functioning which occurred at the termination of intensive programming suggests the need for continued intervention, characterized by low pupil-teacher ratios which make possible the interaction necessary for language development and which provide the opportunity to design and implement learning experiences to achieve specific objectives.

Since the intent of preschool intervention for disadvantaged children is to alter in positive ways later school performance, both structured programs (B-E and K_1) must be judged successful. Virtually all of the children in the two structured programs were making at lease adequate academic progress. In spite of two years of traditional preschool programming, nearly half of the children in the K_2 group obtained California Achievement TEst scores which indicated sharply limited school achievement. This differential achievement level demonstrates the potential for school success among disadvantaged children which can be developed through structured preschool experiences.

DISCUSSIONS AND CONCLUSIONS ON FOLLOW-UP THROUGH THE THIRD GRADE OF THREE OF THE FIVE PROGRAMS

I will now present results and analyses of follow-up data at the end of the third grade. The differences among the group in intellectual functioning as measured by the Stanford-Binet Individual Intelligence Scale had disappeared by the end of the first grade (test four) Figure 4.

The reading achievement of the three groups, as measured by the California Achievement Test, reveals significant differences among the groups through the third grade as is noted in Figure 4. At the end of the third grade, the K_1 group was significantly higher than the K_2 and B-E groups, and the K_1 group was at grade level. The B-E and K_2 groups were about one-fifth year below grade level and the K_1 group.

Generally, one can say from the longitudinal comparison of the three programs that the two programs that were initially most successful had a high level of verbal interactive behavior. These two programs (K_1 and B-E) were highly structured and characterized by careful planning toward academic-cognitive goals. At the end of the third grade, however, the one program that remained significantly higher than the other two in academic achievement was the K_1 program. The difference between the two initially more effective programs (B-E and K_1) at the end of the third grade may well be attributed to the greater emphasis on divergent responses and teaching for transfer associated with the K_1 program.

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The five programs of classroom intervention may be distinguished as follows:

1. The major goals of the *Traditional* nursery school program (K_2 were to promote the personal, social, motor, and general language development of the children. Karnes directed the program and instructed the teachers to capitalize on opportunities for incidental and informal learning, to encourage the children to talk and to ask questions, and to stimulate their interest in the world around them. Music and art activities were schedul . regularly. There was a daily story period. Outdoor play was a part of the daily routine; indoor play focused on centers of interest. Through in-service training, the teachers were made aware of the strengths and weaknesses of disadvantaged children. This preschool was modeled after the Child Development Laboratory program at the University of Illinois.

2. The *Community-Integrated* program, operated at four neighborhood centers, provided a traditional nursery school experience similar to the one above. These centers were licensed by the state and were sponsored by community groups. Classes were composed predominately of middle- and upper-class Caucasian children. Two to four disadvantaged children from the research pool attended sessions at one of these four centers. Socioeconomic integration was the pertinent variable, rather than racial integration, which was achieved in all programs. Central to the altered classroom dynamics in the Community-Integrated program was the presence of an advantaged-peer language model in addition to the teacher model provided in all programs. To the extent that all children in a traditional nursery school acquired language from each other, the Community-Integrated program provided the optimum setting for verbal development. Observational data, however, revealed that the disadvantaged were on the fringes and interacted little verbally with the other children.

3. The *Montessori* program was administered by the local society, and staff and classroom materials met Montessori standards. The daily schedule began with a routine health check and toileting. The group then met "on the line" for conversation, songs, fingerplays, and exercises. The next half hour was devoted to "spontaneous choice" of approved materials and was followed by a second period on the line devoted to musical activities, stories, and games. A "practical life" demonstration, juice time, toileting, the silence exercise, and tidying the classroom occupied the next half hour. The final ten or twenty minutes of the session were given over to playground activities or supervised short walks. The specific nature of the "prepared environment" raised the level of structure within the Montessori classroom beyond that of the two structure within the Montessori classroom beyond that of the two traditional programs. The Montessori teacher did not, however, maintain the high level of specific control over the actions of the children provided by the teachers in the two highly structured programs. Structure in the Montessori program did not usually derive from direct teacher-child interaction, but rather from the prescribed manner in which the child learned from the materials. Observational data

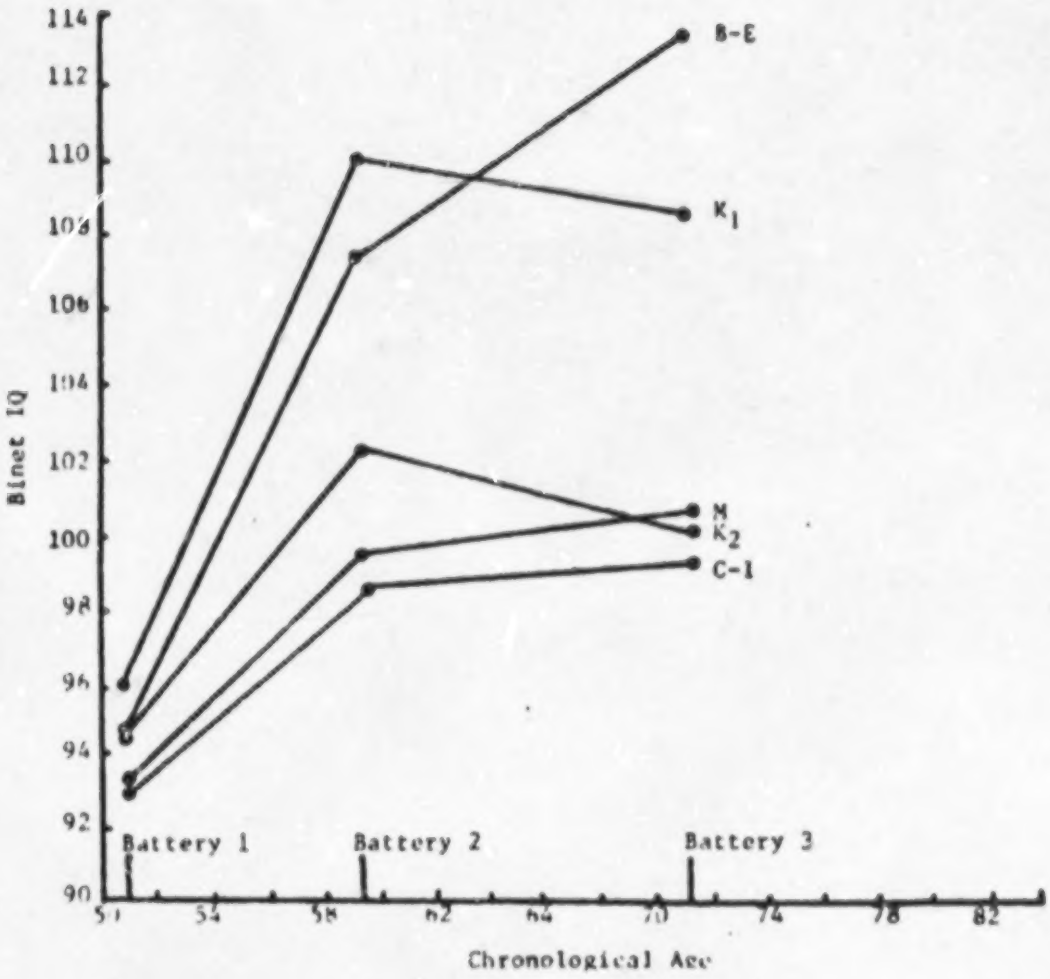
revealed that there was very little verbal interaction among the children and between children and adults as compared to the two highly structured programs of Bereiter-Engelmann and Karnes (K_1), and to a more limited extend the K_2 (Traditional) program.

4. In the *Karnes structured cognitive* program (K_1), a psycholinguistic model derived from the clinical model of the Illinois Test of Psycholinguistic Abilities was used to guide instruction. Since inadequate language represented one of the greatest problem areas for the low-income child, verbalizations in conjunction with the manipulation of concrete materials were considered to be the most effective means of establishing new language responses. Initially each class was divided into three groups of five children,on the basis of IQ and teacher evaluation. A game format (card packs, lotto games, models and miniatures, sorting, matching, and classifying games) created situations where verbal responses could be made repeatedly in a productive, meaningful context without resorting to rote repetition. If the child was unable to make a verbal response, the teacher supplied an appropriate model. When the child began to initiate the responses, the teacher had the opportunity to correct, modify, and expand his verbalizations. Particular prominence was given to helping the child acquire the effective information-processing skills needed to cope successfully with school tasks (Karnes et al. 1972). Each teacher taught three twenty-minute structured periods to the same group of five children. The remainder of the morning was given to music, aret, directed play, snack time, and rest.

5. In the *Bereiter-Engelmann* (B-E) program (Bereiter & Engelmann 1966; Bereiter 1972), intensive oral drill in verbal and logical patterns was chosen as the mode for instruction, since disadvantaged children were considered adequate in perceptual and motoric skills but inadequate in verbal and abstract skills. Each B-E class was divided into small groups on the same basis as the K_1 group. Each of the three teachers conducted a twenty-minute learning (language, arithmetic or reading) for the three groups. The general instructional strategy was that of the rule followed by application. A verbal formula was learned by rote and then applied to a series of anaologous examples of increasing difficulty.

FIGURE 1

Stanford-Binet IQ
Five Groups for Two Years



Note: The times of the three batteries were plotted at the mean Binet chronological age of the three groups.

FIGURE 2

DIFFERENCE SCORE MEANS FOR THE THREE ITPA SUBTESTS

IN WHICH THE FIVE GROUPS DEMONSTRATED THE GREATEST INITIAL DEFICIT

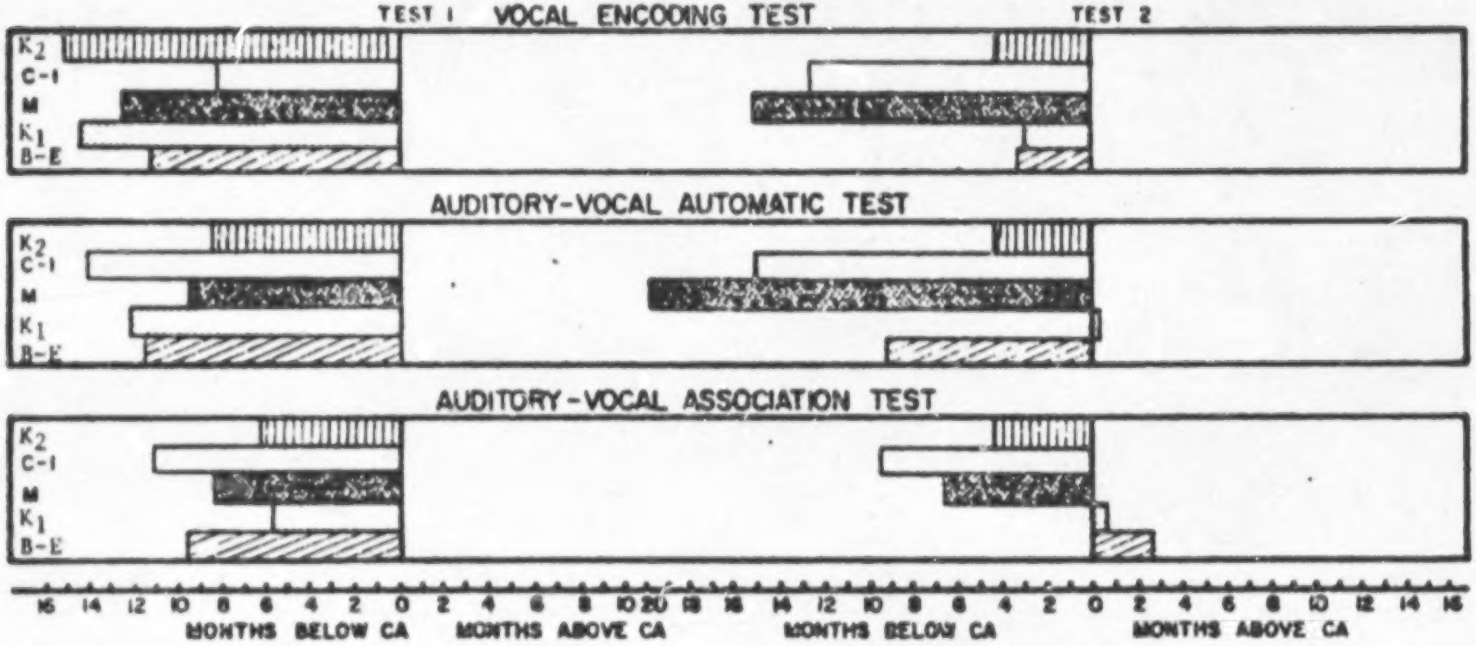

TEST 1 VOCAL ENCODING TEST
TEST 2
K2
C-1
M
K1
B-E
AUDITORY-VOCAL AUTOMATIC TEST
AUDITORY-VOCAL ASSOCIATION TEST
16 14 12 10 8 6 4 2 0 2 4 6 8 10 20 18 16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 16
MONTHS BELOW CA
MONTHS ABOVE CA
MONTHS BELOW CA
MONTHS ABOVE CA

FIGURE 3

Combined ITPA Verbal Expressive
(Verbal Expression, Auditory Vocal Automatic, Auditory Association)
Difference Score Means--Five Groups for Two Years

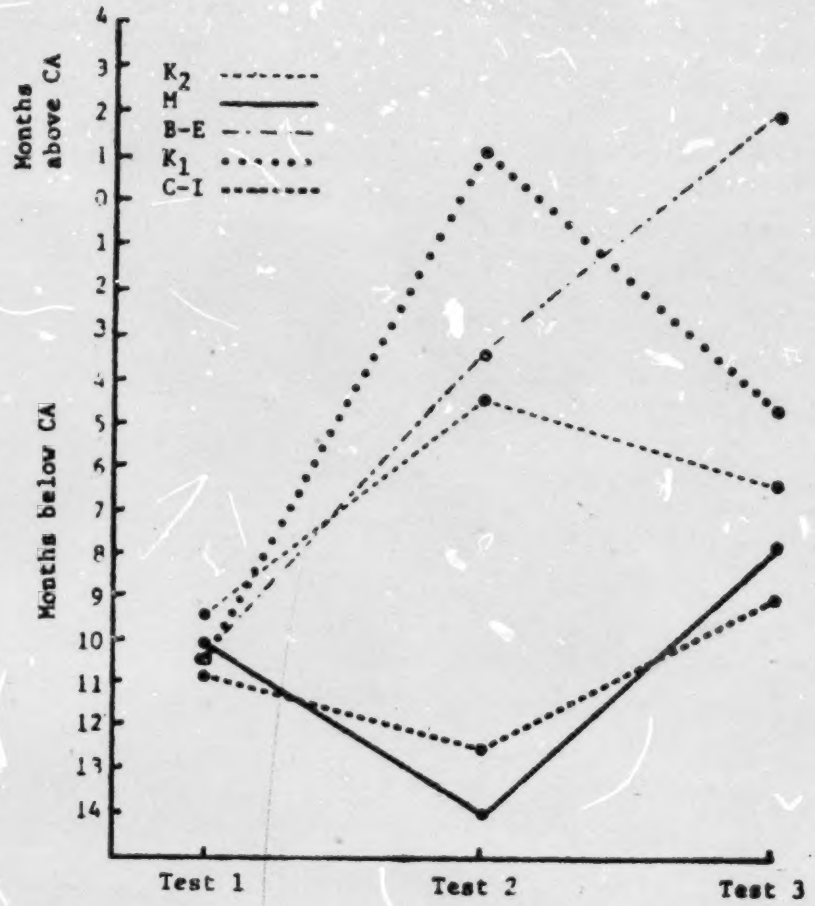


FIGURE 4

Stanford-Binet IQ

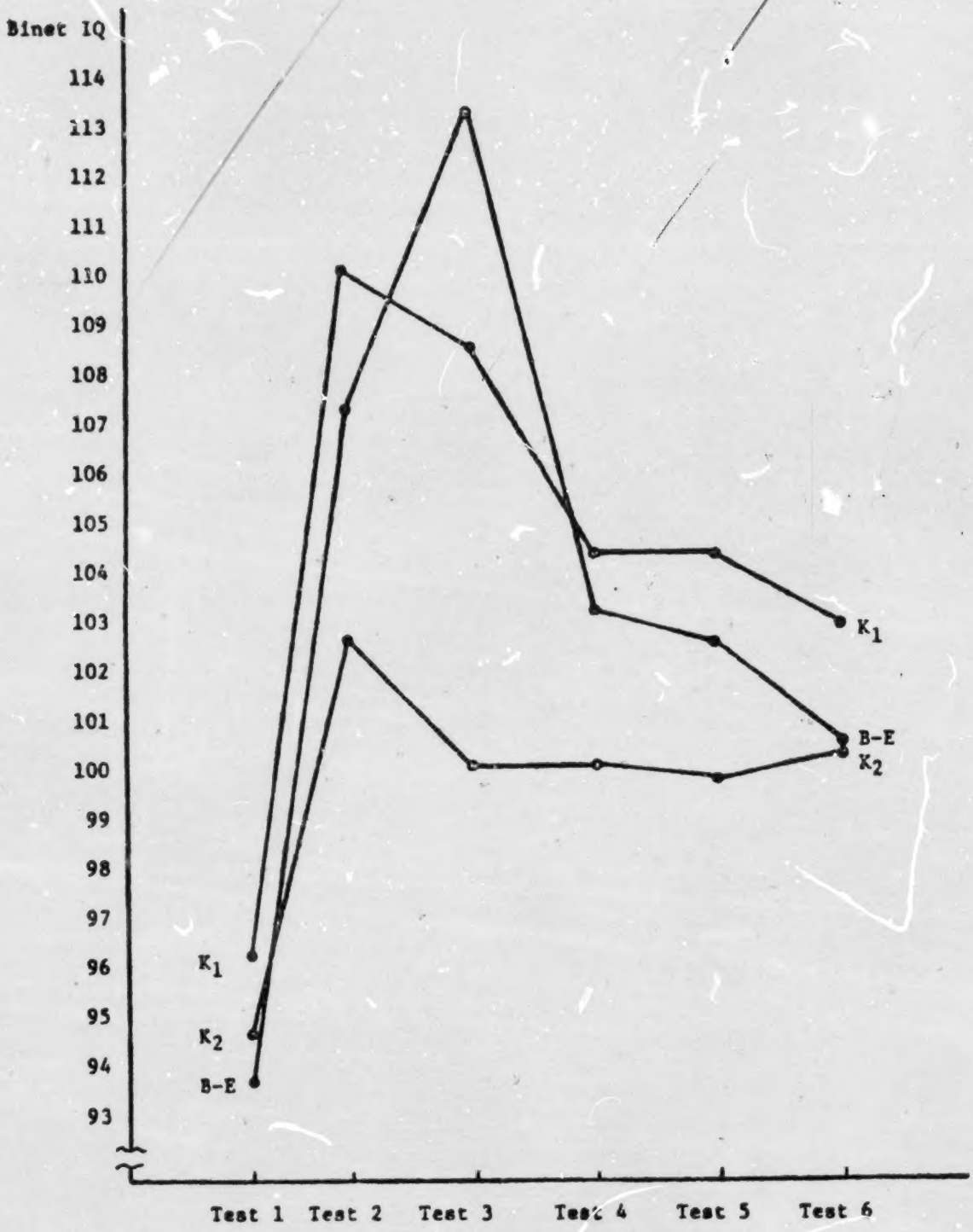
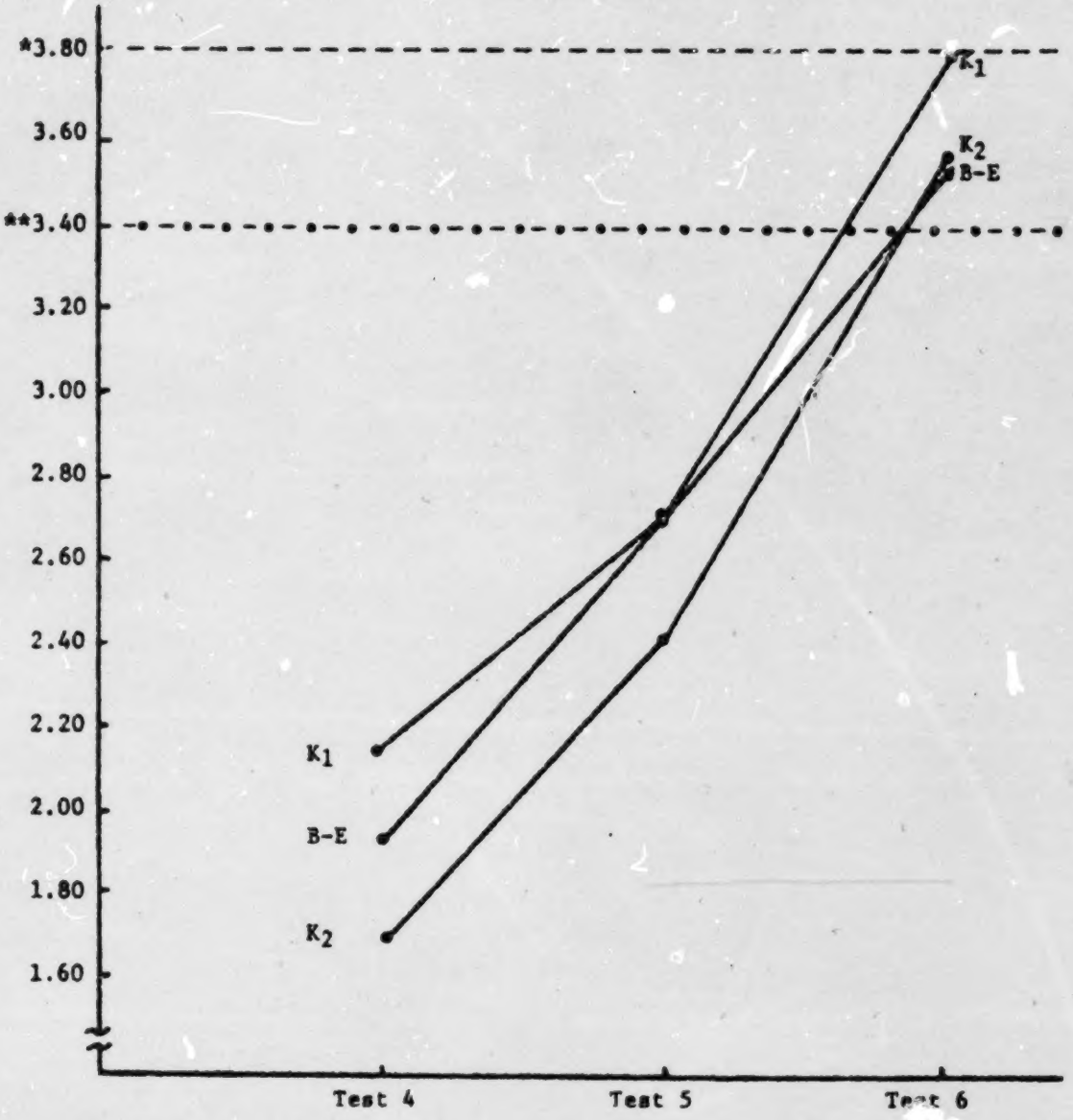


FIGURE 5

California Achievement Test

Total Reading Grade
Placement Scores



* – – – – – represents grade expectancy based on month of testing and initial mean IQ of K_1.

** – • – • – • represents grade expectancy based on month of testing and Test 6 mean IQ of K_1.